

REMARKS

Claims 1-17 are pending. Claim 18 has been added.

Claims 1, 5, 7, 13, and 15 stand rejected under 35 USC §112, second paragraph, as being allegedly indefinite for failing to particularly point out and distinctly claim the subject matter that the Applicant regards as the invention.

Claims 1 and 7 stand rejected under 35 USC §103(a) as being allegedly unpatentable over Singh (US 5,781,289) in view of Koester et al. (US 5,026,159).

Claim 2 stands rejected under 35 USC §103(a) as being allegedly unpatentable over Singh (US 5,781,289) in view of Koester et al. (US 5,026,159) and further in view of Lehureau (US 5,657,304).

Claims 3 and 5 stand rejected under 35 USC §103(a) as being allegedly unpatentable over Singh (US 5,781,289) in view of Koester et al. (US 5,026,159) and further in view of Sabsabi (US 6,008,897).

Claim 4 stands rejected under 35 USC §103(a) as being allegedly unpatentable over Singh (US 5,781,289) in view of Koester et al. (US 5,026,159) and further in view of Sabsabi (US 6,008,897).

Claims 6 and 15 stand rejected under 35 USC §103(a) as being allegedly unpatentable over Singh (US 5,781,289) in view of Koester et al. (US 5,026,159) and further in view of Magee et al (US 4,758,533).

Claim 8 stands rejected under 35 USC §103(a) as being allegedly unpatentable over Singh (US 5,781,289) in view of Koester et al. (US 5,026,159) and further in view of Official Notice.

Claim 9 stands rejected under 35 USC §103(a) as being allegedly unpatentable over Singh (US 5,781,289) in view of Koester et al. (US 5,026,159) and further in view of Andre (US 5,583,634).

Claim 10 stands rejected under 35 USC §103(a) as being allegedly unpatentable over Singh (US 5,781,289) in view of Koester et al. (US 5,026,159) and further in view of Svanberg (US 4,786,813).

Claim 11 stands rejected under 35 USC §103(a) as being allegedly unpatentable over Singh (US 5,781,289) in view of Koester et al. (US 5,026,159) and further in view of Lehureau (US 5,657,304).

Claim 12 stands rejected under 35 USC §103(a) as being allegedly unpatentable over Singh (US 5,781,289) in view of Koester et al. (US 5,026,159) and further in view of Sabsabi (US 6,008,897) and further in view of Sabsabi (US 5,781,289).

Claim 13 stands rejected under 35 USC §103(a) as being allegedly unpatentable over Singh (US 5,781,289) in view of Sabsabi (US 6,008,897) and further in view of Sabsabi (US 6,008,897).

Claim 14 stands rejected under 35 USC §103(a) as being allegedly unpatentable over Singh (US 5,781,289) in view of Koester et al. (US 5,026,159) and further in view of Sabsabi (US 6,008,897) and further in view of Magee (US 4,758,533).

Claim 16 stands rejected under 35 USC §103(a) as being allegedly unpatentable over Singh (US 5,781,289) in view of Koester et al. (US 5,026,159) and further in view of Official Notice and further in view of Andre (US 5,583,634).

Claim 17 stands rejected under 35 USC §103(a) as being allegedly unpatentable over Singh (US 5,781,289) in view of Koester et al. (US 5,026,159) and further in view of Andre (US 5,583,634) and further in view of Svanberg et al. (US 4,786,813).

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned “**VERSION WITH MARKINGS TO SHOW CHANGES MADE.**”

Changes in the Abstract:

The Abstract has been amended to remove “Figure 1” at line 11. No new matter has been added.

Changes in the Claims:

Claims 1-17 have been amended and claim 18 has been added in this application to further particularly point out and distinctly claim subject matter regarded as the invention. No new matter has been added.

Amendments to claim 1 are supported by the specification at page 17, lines 5-25.

Objections to claim 1:

Claim 1 has been amended to correct the misspellings pointed by the Office Action (“analysed” at line 8, and “analysing” at line 26).

Rejection under 35 USC §112, second paragraph – claims 1, 5, 7, 13, and 15

Claims 1, 5, 7, 13, and 15 stand rejected under 35 USC §112, second paragraph, as being allegedly indefinite for failing to particularly point out and distinctly claim the subject matter that the Applicant regards as the invention. This rejection is respectfully traversed.

MPEP §2171 identifies two separate requirements: (1) the claims must set forth the subject matter that applicants regard as their invention; and (2) the claims must particularly point out and distinctly define the meets and bounds of the subject matter that will be protected by the patent grant. A lack of antecedent basis may be found if a claim is “indefinite” because “it contains words or phrases whose meaning is unclear”; see MPEP §2173.05(e).

The Office Action alleges that the term “possibly” in claim 1 renders the claim indefinite. Claim 1 has been amended to delete this term.

The Office Action alleges that the term “capable to” in claim 5 and 13 renders the claim indefinite. Claims 5 and 13 have been amended to delete this term.

The Office Action alleges that the term “capable to” in claim 7 and 15 renders the claim indefinite. Claims 7 and 15 have been amended to replace this term with “for”.

The claims now meet the statutory requirements.

Rejection under 35 USC §103(a) – claims 1 and 7

Claims 1 and 7 stand rejected under 35 USC §103(a) as being allegedly unpatentable over Singh (US 5,781,289) in view of Koester et al. (US 5,026,159). This rejection is respectfully traversed.

Under MPEP §706.02(j), in order to establish a prima facie case of obviousness required for a §103 rejection, three basic criteria must be met: (1) there must be some suggestion or motivation either in the references or knowledge generally available to modify the reference or combine reference teachings (MPEP §2143.01), (2) a reasonable expectation of success (MPEP §2143.02), and (3) the prior art must teach or suggest all the claim limitations (MPEP §2143.03). See In re Royka, 490 F. 2d 981, 180 USPQ 580 (CCPA 1974).

Singh teaches an apparatus for conducting laser-induced breakdown spectroscopy where a laser beam focused on a sample creates atomic emissions that are analyzed. Col.6, lines 40-41. As pointed by the Office Action, Singh lacks a diaphragm, and a first optical means for projecting the image of the diaphragm to infinity. Furthermore, Singh teaches a fiber optic link (10) located on the behind lenses (9) and (8) on the side of the mirror (4) opposite to the lenses (5) and sample (6). “It is preferable for the emission spectrum to be transmitted via focusing lens (5), and separated from the laser light through the dichroic mirror (4), before being directed to the detector (11).” Col. 6, lines 42-47.

Contrary to the presently claimed invention, Singh proposes a device that does not make it possible to:

- obtain an optical emission spectrum on a continuous wavelength interval, because of the anti-reflective treatment of the dichroic mirror (transmission from 180nm to 510nm and from 550nm to 1000nm),

- install an object imaging device, because the spectrum analysis must take place in front of the analyzed object, which is the only location where a camera can be positioned (the spectrum analysis is carried out via fiber 14 in the present application),

- obtain a large numerical aperture, for a better control of the laser-matter interaction; Singh uses a lens (5) that induces aberrations as soon as a user attempts to reach a numerical aperture greater than 0.1.

Koester teaches a photo-coagulation apparatus concentrating a beam of light on a selected area of the fundus of a patient's eye. Col 7. Lines 54-56. The diaphragm in Koester is used as a mask for protecting the areas of the eye that must not be irradiated, by limiting the diameter of the beam. The diaphragm or screen 28 has an aperture of **adjustable** diameter. See col. 4, lines 13-18. Such device does not make it possible to keep a **constant** value for the resolution of the impact of the probe beam. In contrast, the presently claimed invention delimits the area of the interaction of the laser with the target with a diaphragm having an aperture of a **fixed** diameter.

The combination of the teachings of Singh and Koester does not teach or suggest the limitations of claim 1. In particular, a combination of Singh and Koester does not teach or suggest "a diaphragm having an aperture of a **fixed diameter**", "means for analyzing **disposed adjacent** to the plasma", or "**means for displacing said object** within a plane **after each pulse** of said laser source." Claim 1. Neither Singh nor Koester

discloses or teach “means for displacing said object within a plane after each pulse of said laser source.”

Thus, Applicant submits that claims 1 and 7 recite novel subject matter which distinguishes over any possible combination of Singh and Koester.

Rejection under 35 USC §103(a) – claim 2

Claim 2 stands rejected under 35 USC §103(a) as being allegedly unpatentable over Singh (US 5,781,289) in view of Koester et al. (US 5,026,159) and further in view of Lehureau (US 5,657,304). This rejection is respectfully traversed.

These rejections are respectfully traversed for at least the reason that each of the rejected claims ultimately depend on an above-discussed base claim. The arguments set forth above regarding the base claims are equally applicable here. The base claims being allowable, the dependent claims must also be allowable.

Rejection under 35 USC §103(a) – claims 3 and 5

Claims 3 and 5 stand rejected under 35 USC §103(a) as being allegedly unpatentable over Singh (US 5,781,289) in view of Koester et al. (US 5,026,159) and further in view of Sabsabi (US 6,008,897). This rejection is respectfully traversed.

These rejections are respectfully traversed for at least the reason that each of the rejected claims ultimately depend on an above-discussed base claim. The arguments set forth above regarding the base claims are equally applicable here. The base claims being allowable, the dependent claims must also be allowable.

Rejection under 35 USC §103(a) – claim 4

Claim 4 stands rejected under 35 USC §103(a) as being allegedly unpatentable over Singh (US 5,781,289) in view of Koester et al. (US 5,026,159) and further in view of Sabsabi (US 6,008,897). This rejection is respectfully traversed.

These rejections are respectfully traversed for at least the reason that each of the rejected claims ultimately depend on an above-discussed base claim. The arguments set forth above regarding the base claims are equally applicable here. The base claims being allowable, the dependent claims must also be allowable.

Rejection under 35 USC §103(a) – claims 6 and 15

Claims 6 and 15 stand rejected under 35 USC §103(a) as being allegedly unpatentable over Singh (US 5,781,289) in view of Koester et al. (US 5,026,159) and further in view of Magee et al (US 4,758,533). This rejection is respectfully traversed.

These rejections are respectfully traversed for at least the reason that each of the rejected claims ultimately depend on an above-discussed base claim. The arguments set forth above regarding the base claims are equally applicable here. The base claims being allowable, the dependent claims must also be allowable.

Rejection under 35 USC §103(a) – claim 8

Claim 8 stands rejected under 35 USC §103(a) as being allegedly unpatentable over Singh (US 5,781,289) in view of Koester et al. (US 5,026,159) and further in view of Official Notice. This rejection is respectfully traversed.

These rejections are respectfully traversed for at least the reason that each of the rejected claims ultimately depend on an above-discussed base claim. The arguments set forth above regarding the base claims are equally applicable here. The base claims being allowable, the dependent claims must also be allowable.

Rejection under 35 USC §103(a) – claim 9

Claim 9 stands rejected under 35 USC §103(a) as being allegedly unpatentable over Singh (US 5,781,289) in view of Koester et al. (US 5,026,159) and further in view of Andre (US 5,583,634). This rejection is respectfully traversed.

These rejections are respectfully traversed for at least the reason that each of the rejected claims ultimately depend on an above-discussed base claim. The arguments set forth above regarding the base claims are equally applicable here. The base claims being allowable, the dependent claims must also be allowable.

Rejection under 35 USC §103(a) – claim 10

Claim 10 stands rejected under 35 USC §103(a) as being allegedly unpatentable over Singh (US 5,781,289) in view of Koester et al. (US 5,026,159) and further in view of Svanberg (US 4,786,813). This rejection is respectfully traversed.

These rejections are respectfully traversed for at least the reason that each of the rejected claims ultimately depend on an above-discussed base claim. The arguments set forth above regarding the base claims are equally applicable here. The base claims being allowable, the dependent claims must also be allowable.

Rejection under 35 USC §103(a) – claim 11

Claim 11 stands rejected under 35 USC §103(a) as being allegedly unpatentable over Singh (US 5,781,289) in view of Koester et al. (US 5,026,159) and further in view of Lehureau (US 5,657,304). This rejection is respectfully traversed.

These rejections are respectfully traversed for at least the reason that each of the rejected claims ultimately depend on an above-discussed base claim. The arguments set forth above regarding the base claims are equally applicable here. The base claims being allowable, the dependent claims must also be allowable.

Rejection under 35 USC §103(a) – claim 12

Claim 12 stands rejected under 35 USC §103(a) as being allegedly unpatentable over Singh (US 5,781,289) in view of Koester et al. (US 5,026,159) and further in view of Sabsabi (US 6,008,897) and further in view of Sabsabi (US 5,781,289). This rejection is respectfully traversed.

These rejections are respectfully traversed for at least the reason that each of the rejected claims ultimately depend on an above-discussed base claim. The arguments set forth above regarding the base claims are equally applicable here. The base claims being allowable, the dependent claims must also be allowable.

Rejection under 35 USC §103(a) – claim 13

Claim 13 stands rejected under 35 USC §103(a) as being allegedly unpatentable over Singh (US 5,781,289) in view of Sabsabi (US 6,008,897) and further in view of Sabsabi (US 6,008,897). This rejection is respectfully traversed.

These rejections are respectfully traversed for at least the reason that each of the rejected claims ultimately depend on an above-discussed base claim. The arguments set forth above regarding the base claims are equally applicable here. The base claims being allowable, the dependent claims must also be allowable.

Rejection under 35 USC §103(a) – claim 14

Claim 14 stands rejected under 35 USC §103(a) as being allegedly unpatentable over Singh (US 5,781,289) in view of Koester et al. (US 5,026,159) and further in view of Sabsabi (US 6,008,897) and further in view of Magee (US 4,758,533). This rejection is respectfully traversed.

These rejections are respectfully traversed for at least the reason that each of the rejected claims ultimately depend on an above-discussed base claim. The arguments set forth above regarding the base claims are equally applicable here. The base claims being allowable, the dependent claims must also be allowable.

Rejection under 35 USC §103(a) – claim 16

Claim 16 stands rejected under 35 USC §103(a) as being allegedly unpatentable over Singh (US 5,781,289) in view of Koester et al. (US 5,026,159) and further in view

of Official Notice and further in view of Andre (US 5,583,634). This rejection is respectfully traversed.

These rejections are respectfully traversed for at least the reason that each of the rejected claims ultimately depend on an above-discussed base claim. The arguments set forth above regarding the base claims are equally applicable here. The base claims being allowable, the dependent claims must also be allowable.

Rejection under 35 USC §103(a) – claim 17

Claim 17 stands rejected under 35 USC §103(a) as being allegedly unpatentable over Singh (US 5,781,289) in view of Koester et al. (US 5,026,159) and further in view of Andre (US 5,583,634) and further in view of Svanberg et al. (US 4,786,813). This rejection is respectfully traversed.

These rejections are respectfully traversed for at least the reason that each of the rejected claims ultimately depend on an above-discussed base claim. The arguments set forth above regarding the base claims are equally applicable here. The base claims being allowable, the dependent claims must also be allowable.

Conclusion

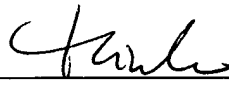
For all of the above reasons, applicants submit that the amended claims are now in proper form, and that the amended claims all define patentable subject matter over the prior art. Therefore, Applicants submit that this application is now in condition for allowance.

Request for allowance

It is believed that this Amendment places the above-identified patent application into condition for allowance. Early favorable consideration of this Amendment is earnestly solicited. If, in the opinion of the Examiner, an interview would expedite the prosecution of this application, the Examiner is invited to call the undersigned attorney at the number indicated below.

Respectfully submitted,
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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Specification:

The paragraph starting at line 11 of the abstract has been deleted.

The paragraph starting at page 8, line 24, has been amended as follows:

-- The invention enables the laser source to cooperate with the diaphragm and the first and second optical means to create a single laser pulse on the object with an impact with a power per unit area [equal to] greater than 1 GW/cm^2 , this power per unit area preferably being equal to or greater than 10 GW/cm^2 . --

The paragraph starting at page 9, line 1, has been amended as follows:

-- According to a preferred embodiment of the invention, the second optical means have a [digital] numerical aperture equal to or greater than 0.1.--

The paragraph starting at page 15, line 23, has been amended as follows:

-- This objective 12 also has a large [digital] numerical aperture, greater than or equal to 0.1. This choice prevents interaction of the laser beam with the plasma 28 generated during laser ablation. --

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The paragraph starting at page 10, line 5, has been amended as follows:

-- Preferably, the first and second optical means are anti-reflection treated [for reflections] at the wavelength of the light emitted by the laser source. --

In the claims:

Claim 18 has been added.

Claims 1-17 have been amended as follows:

1. (Once Amended) Elementary analysis device by optical emission spectrometry on laser produced plasma, [this] the device [being characterized in that it comprises] comprising:

[-] a pulsed laser source (6);

[-] a diaphragm (8) [usable] having an aperture of a fixed diameter for selecting part of [the] a laser beam emitted by [the] said pulsed laser source[, and possibly delimiting the shape of the impact of the laser beam] on an object to be [analysed] analyzed (2), [this] said laser beam not being focused in the plane of [the] said diaphragm[.];

[-] first optical means (10) [capable of] projecting the image of [the] said diaphragm to infinity[.];

[-] second optical means (12) [designed to receive] receiving the image of [the] said diaphragm projected to infinity by [the] said first optical means and focusing it on [the] said object to be [analysed] analyzed to produce plasma (28) on the surface of [this] said object, [the assembly formed by the diaphragm and the first and second optical means also satisfying the following conditions:]

wherein the image of [the] said diaphragm focused on [the] said object is equal to the required dimension on [this] said object; and

the focal point of [the] said laser beam, after crossing through [the] said diaphragm and [the] said first and second optical means, is outside the image plane of [the] said diaphragm;

[-] means (16, 18) [of analysing] for analyzing a light radiation spectrum emitted by the plasma, [and] said means for analyzing disposed adjacent to the plasma;

[-] means (20) [of] for determining the elementary composition of [the] said object [starting] from this spectrum analysis; and

means for displacing said object within a plane after each pulse of said laser source.

2. (Once Amended) Device according to claim 1, [in which the] wherein said second optical means (12) have a [digital] numerical aperture equal to approximately 0.1 or greater.

3. (Twice Amended) Device according to claim 1, [in which] wherein the impact size of the laser beam on the object is greater than or equal to 1 μm .

4. (Twice Amended) Device according to claim 1, [in which] wherein the displacement frequency of the object (2) between two laser pulses of the source (6) is greater than or equal to 15 Hz.

5. (Twice Amended) Device according to claim 1, [in which] wherein the pulsed laser source (6) [is capable of emitting] emits ultraviolet light.

6. (Twice Amended) Device according to claim 1, [in which] wherein the relative variation of energy between [1] one laser pulse and the next does not exceed 5%.
7. (Twice Amended) Device according to claim 1, [in which the] wherein said diaphragm (8) comprises a circular aperture [capable of] for selecting the central part of the laser beam output from the laser source, [the] said first optical means [are] comprise refractive optical means, and [the] said second optical means [are] comprise refractive optical means [comprising] having a microscope objective (12).
8. (Twice Amended) Device according to claim 7, [in which the] wherein said first and second optical means (10, 12) are anti-reflection treated [for reflections] at the wavelength of the light emitted by [the] said pulsed laser source (6).
9. (Twice Amended) Device according to claim 1, [also] further comprising means (38) [of] for blowing a gas jet onto [the] said object (2).
10. (Twice Amended) Device according to claim 1, [also] further comprising:
- [-] means (32) [of] for observing [the] said object, so that [the] said object can be placed in the image plane of [the] said diaphragm; and
- [-] a mirror (26) reflecting at the wavelength of [the] said pulsed laser source and transparent at other wavelengths, [this] said mirror being placed on the light path between [the] said first and second optical means and designed to reflect almost the entire laser

beam to [these] said second optical means and to transmit an image of [the] said object to [the observation] said means for observing.

11. (Once Amended) Device according to claim 2, [in which] wherein the impact size of the laser beam on [the] said object is greater than or equal to 1 μm .

12. (Once Amended) Device according to claim 3, [in which] wherein the displacement frequency of [the] said object (2) between two laser pulses of [the] said pulsed laser source (6) is greater than or equal to 15 Hz.

13. (Once Amended) Device according to claim 1, [in which the] wherein said pulsed laser source (6) [is capable of emitting] emits ultraviolet light.

14. (Once Amended) Device according to claim 1, [in which] wherein the relative variation of energy between [1] one laser pulse and the next does not exceed 5%.

15. (Once Amended) Device according to claim 6, [in which the] wherein said diaphragm (8) comprises a circular aperture [capable of] for selecting the central part of the laser beam output from the laser source, [the] said first optical means are refractive optical means, and [the] said second optical means are refractive optical means comprising a microscope objective (12).

16. (Once Amended) Device according to claim 8, [also] further comprising means (38) [of] for blowing a gas jet onto [the] said object (2).

17. (Once Amended) Device according to claim 1, [also] further comprising:

[-] means (32) [of] for observing [the] said object, so that [the] said object can be placed in the image plane of [the] said diaphragm; and

[-] a mirror (26) reflecting at the wavelength of [the] said pulsed laser source and transparent at other wavelengths, [this] said mirror being placed on the light path between [the] said first and second optical means and designed to reflect almost the entire laser beam to these second optical means and to transmit an image of [the] said object to [the observation] said means for observing.

18. (New) Device according to claim 1, wherein said diaphragm is also usable for delimiting the shape of the impact of the laser beam on an object to be analyzed.